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	Examiner Name	Reena Aurora	
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Date	March 8, 2004	

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BEFORE THE UNITED STATES PATENT AND TRADEMARK OFFICE  
BOARD OF PATENT APPEALS AND INTERFERENCES

In re application of: Macmillan M. Wisler et al.	§ Appeal No. _____
U.S. Serial No.: 09/760,679	§
Filed: January 16, 2001	§ Group Art Unit: 2852
For: "Method and Apparatus for	§ Examiner: Reena Aurora
Measuring Resistivity and Dielectric	§
In a Well Core in a Measurement	§ Confirmation No.: 4076
While Drilling Tool"	§ Docket No. 414-16782-US

**BRIEF FOR APPELLANTS (37 CFR §1.192)**

MS Appeal Brief - Patents  
Commissioner for Patents  
P. O. Box 1450  
Alexandria, Virginia 22313-1450

Sir:

Appellants hereby submit their brief on appeal from the decision rendered by the Examiner finally rejecting claims 2-14, 16-26, 28-34 and 36-41, mailed October 9, 2003 (OFFICE ACTION), in furtherance of the Notice of Appeal filed January 7, 2004.

The fees required under 37 CFR §1.17(c), and any required petition for extension of time for filing this brief and fees therefor, are dealt with in the accompanying Transmittal of Appeal Brief.

This Brief is transmitted in triplicate.

The final page of this brief bears the attorney's signature.

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Beth Pearson-Naul

3-8-04  
Date

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### **I. REAL PARTY IN INTEREST**

The real party in interest in this appeal is Baker Hughes Incorporated.

### **II. RELATED APPEALS AND INTERFERENCES**

Appellants, their legal representative, and their assignee are unaware of any other appeals or interferences which will directly affect or would be directly affected by or have a bearing on the Board’s decision in this pending appeal.

### **III. STATUS OF CLAIMS**

The claims appealed are claims 2-14, 16-26, 28-34, and 36-41, which were finally rejected in paper no. 14, mailed October 9, 2003. A Notice of Appeal was filed January 7, 2004.

### **IV. STATUS OF AMENDMENTS**

Original claims 1-41 were filed on January 16, 2001. The application and claims were amended by Applicant's amendments filed on April 7, 2003 and again on May 21, 2003. All amendments have been entered. No amendment to the claims has been made or entered after the final action. The claims as amended appear in Appendix A.

### **V. SUMMARY OF THE INVENTION**

The claims on appeal are directed to an apparatus for measuring downhole a parameter of interest of a material in a subterranean formation in claims 2-14 and 28-34, and to a method for determining a parameter of interest of a material in claims 16-26 and 36-41.

An important part of the invention relates to performing the claimed measurements on material in a cylindrical enclosure conveyed down hole on a drilling tubular and where the material is separated from a formation by a core bit. The claims require using a spaced apart transmitter and receiver pair to irradiate the material with electromagnetic energy using at least two frequencies.

One advantage of the invention stated at page 4, lines 16-18 is the ability to determine the characteristics of a core sample while the sample is in its original environment and while in its original orientation relative to the surrounding formation.

Another advantage of the claimed arrangement is that a spaced apart transmitter/receiver makes it possible to fully compensate for linear changes to the measurement system.

### **VI. ISSUES**

The sole issue on appeal is:

1. Whether the Examiner has established a case of *prima facie* obviousness of all of the claims in the application, 2-14, 16-26, 28-34, and 36-41, and whether those

claims are non-obvious under 35 U.S.C. §103(a) over U.S. Pat. No. 6,003,620 to Sharma et al. (Sharma et al.) in view of U.S. Pat. No. 5,209,104 to Collins et al. (Collins et al.) and further in view of U.S. Pat. No. 4,996,489 to Sinclair (Sinclair).

## **VII. GROUPING OF CLAIMS**

The claims in the application do not stand or fall together. The claims are grouped as follows. **Group 1** claims are claims 2-14 and 16-26 which claim respective apparatus and methods that include the structural limitation of at least one transmitter having an antenna and at least one receiver having an antenna, the antennas being axially displaced. **Group 2** claims are claims 28-34, and 36-41. These claims require the structural limitation of at least two transmitters each having an antenna and at least two receivers each having an antenna, wherein the at least two transmitters are symmetrically arranged about the at least two receivers. The claims of Group 1 are considered to stand or fall together. The claims of Group 2 are considered to stand or fall together.

## **VIII. ARGUMENT**

### **A. Brief Summary of the References**

#### **1. U.S. Pat. No. 6,003,620 to Sharma et al.**

Sharma et al. '620 relates to a device for testing a core sample using a sensor array that comprises an array of electrode sensors **70**. The downhole measurement device **29** uses the sensor array of electrodes **70** to generate and measure direct or alternating currents and voltages.

Sharma mentions that the electrode array **70** may use alternative types of electrodes that may include ring electrodes, induction coils, or plate electrodes, where any of the electrodes may use conducting materials that comprise metals, carbon and conductive polymers, and or ceramics.

Sharma particularly discusses that measurements are made with the electrode sensor array **70** using the *adjacent four-electrode protocol*. This protocol uses an adjacent pair of electrodes where a fixed AC current composed of one or more frequencies is emitted and received between an adjacent pair of electrodes and the potential differences between all other adjacent electrode pairs are measured. The measurements may be repeated for other adjacent pairs of electrodes acting as the sources and sinks for the

current. The multiple frequencies used by the present invention may comprise frequencies from approximately 1 KHz to 300 KHz, although other frequency ranges are possible as well. See Sharma et al. '620 column 7, lines 15-30.

Sharma et al. '620 does not teach, mention or suggest using a transmitter antenna axially spaced from a receiver antenna. And Sharma et al. '620 does not teach or suggest at least two transmitters and at least two receivers being symmetrically arranged.

## **2. U.S. Pat. No. 5,209,104 to Collins et al.**

Collins, et al. '104 relates to a method of desaturating a porous rock through a plurality of partial fluid saturations and making electrical resistivity measurements at each such partial fluid saturation may preferably be carried out with the apparatus shown in the drawing. A pressure sleeve **10**, preferably natural or synthetic rubber, is in the form of a cylinder surrounding a core sample **11** of a porous rock to be measured for resistivity at a plurality of fluid saturations. Sleeve **10** is placed inside a suitable pressure vessel (not shown) that can be pressurized up to several thousand pounds per square inch. A fluid inlet **14** and fluid outlet **15** pass through the end plugs **16** and **12** respectively, which are inserted into the sleeve **10**. *Both inlet 16 and outlet 12 end plugs also serve as current conducting electrodes for passing current from a source 20 through the porous rock 11 when it contains a sufficient amount of electrically conducting fluid. At least a pair of voltage electrodes 17 and 18 penetrate sleeve 10 and make contact with the porous rock at spaced-apart positions along the length of the porous rock. More than one pair of electrodes may be used.*

Collins, et al. '104 does not teach, mention or suggest that that the method or apparatus has anything to do with downhole measurements. Nothing in Collins et al. '104 mentions a transmitter or receiver antenna. In particular Collins et al. '104 does not describe a transmitter antenna axially displaced from a receiver antenna. Collins et al. '104 does not teach or suggest at least two transmitters and at least two receivers being symmetrically arranged.

## **3. U.S. Pat. No. 4,996,489 to Sinclair**

Sinclair '489 relates to an apparatus for use in a laboratory to test a core sample. The method taught focuses on comparing measurements made on the core sample with

simultaneous measurements through a standard sample, which is described as typically air. There is a mention of simplifying equations when a core sample fills an entire test cavity. There is however, no teaching of a downhole apparatus. Sinclair '489 does not suggest or mention a apparatus conveyed down hole with a coring bit. Sinclair '489 does not teach or suggest at least two transmitters and at least two receivers being symmetrically arranged.

**B. 35 U.S.C. §103 Rejection over Sharma et al. '620 in view of Collins, et al. '104 and further in view of Sinclair '489**

The Examiner has rejected all of the claims in the application under 35 U.S.C. §103 as allegedly being obvious from U.S. Pat. No. 6,003,620 to Sharma et al. (Sharma et al.) in view of U.S. Pat. No. 5,209,104 to Collins et al. (Collins et al.) and further in view of U.S. Pat. No. 4,996,489 to Sinclair (Sinclair).

**Standards for an Obviousness Rejection**

The standards for rejecting a claim as obvious are clear:

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

35 U.S.C. §103(a). In putting the statutory language to practice, the MPEP states:

To establish a prima facie case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art and not based on applicant's disclosure.

MPEP §706.02(j) Contents of a 35 U.S.C. 103 Rejection, (citing) In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). The Federal Circuit uses the Graham factors:

In order to determine obviousness as a legal matter, four factual inquiries must be made concerning: 1) the scope and content of the prior art; 2) the level of ordinary skill in the art; 3) the differences between the claimed invention and the prior art; and 4) secondary considerations of nonobviousness, which in case law is often said to include commercial success, long-felt but unresolved need, failure of others, copying, and unexpected results.

Ruiz v. A. B. Chance Co., 57 USPQ2d 1161, 1165 (Fed. Cir. 2000) *citing* Graham v. John Deere Co., 383 U.S. 1, 17-18, 148 USPQ 459, 467 (1966); Miles Labs., Inc. v. Shandon, Inc., 997 F.2d 870, 877, 27 USPQ2d 1123, 1128 (Fed. Cir. 1993).

**1. Motivation Not Present for One of Ordinary Skill in the Art to Combine Reference Elements As Claimed**

All claims 2-14, 16-26, 28-34 and 36-41 stand finally rejected based on the combination of Sharma et al. '620, Collins et al. 104 and Sinclair '489. For the reasons stated below, Applicant submits that the Examiner erred in making the combination and has thus failed to present a prima facie case of obviousness.

The Examiner finds that Sharma et al. '620 allegedly teaches the instantly apparatus and method but admits that Sharma et al. '620 fails to teach one receiver having an antenna axially displaced from at least one transmitter antenna. In fact, the word antenna is not found in the reference even though the OFFICE ACTION mischaracterizes item 70 as an antenna at page 2.

The examiner contends that Collins et al. '104 teaches current-conducting electrodes (17,18) for measuring a characteristic of a porous rock. The examiner then combines Collins et al. '104 with Sharma et al. '620 to allege that it is well known to position axially-spaced electrodes or a circumferentially spaced electrode array about a core sample for measuring a characteristic.

The examiner then combines the alleged teaching of Sharma et al. '620 and Collins et al. '104 with Sinclair '489. The examiner admits in the OFFICE ACTION at page 3 that **“an electrode array is not the same as (an) antenna.”** The examiner again



states at page 4 that **“even though electrodes are not antenna, one can be used for the other.”**

It is the Examiner’s position that since an antenna can be used in measuring a core sample characteristic and that an electrode can be used to measure a core sample characteristic, then one can be used for another. Therefore, according to the Examiner at page 3 of the OFFICE action, it would be obvious to one having ordinary skill in the art at the time of the invention to modify the device of Sharma in view of Collins and further in view of Sinclair since it does not matter if the electrodes are axially displaced or transmitting and receiving antennas are axially displaced from each other. The Examiner’s position, therefore, focuses on the function of measuring a characteristic and not the claimed structure. The Examiner is stating diametrically-opposed positions; first that electrodes and antennas are not the same, and second that they are the same.

It is the position of the Applicant that one skilled in the art would not be motivated to combine the references. The Board’s attention is respectfully directed to Sinclair ‘489, which clearly distinguishes an electrode from an antenna. Sinclair ‘489 states in column 2, lines 4-9 the following:

“One of the significant advantages of the present system is the incorporation of the sample in a “circuit” without electrode contact. This is, the sample is placed in a circuit but this is accomplished without attempting electrode connection. Electrode contacts are difficult to connect to core samples.”

Why after reviewing Sinclair ‘489, would one seeking to implement a contactless method of in-situ core sample measurement be motivated to even consider Collins et al. ‘104, which only teaches a laboratory technique using electrodes? Moreover, what would motivate one of ordinary skill in the art to combine the desaturation method of Collins et al. ‘104 with the in-situ core sample measuring technique of Sharma et al. ‘620 as suggested by the Examiner? Nothing in Sharma et al. ‘620 is related to laboratory desaturation techniques. Nothing in Collins et al. 104 is related to measuring a core sample downhole. Furthermore, nothing in Collins et al. ‘104 suggests the equivalence of electrodes to antennas. Silence in the references is not a proper substitute for a disclosure of facts adequate enough to support a conclusion of obviousness, *In re Burt*, 148 U.S.P.Q.

548, 553 (C.C.P.A. 1966). A *prima facie* case must be put forward by the Examiner; missing facts cannot be assumed, *Ex parte Woltes*, 214 U.S.P.Q. 735 (Bd. App. 1979).

The terms electrode and antenna are distinguished by definition as well. The Board's attention is respectfully drawn to the definitions of the terms the examiner finds to be interchangeable. The definition in Merriam-Webster Webster's Ninth New Collegiate Dictionary defines an electrode as 1) a conductor **used to establish electrical contact** with a non-metallic part of a circuit and/or 2) a semiconductor device element that emits or collects electrons or holes or that controls their movements. Webster's defines an antenna as 2) a metallic device (as a rod or wire) **for radiating or receiving radio waves**. Emphasis added here. Applicant respectfully submits that the Examiner has committed error by equating an antenna and an electrode based on the sole fact that tests can be made on a material using each device.

The Examiner is, of course, prohibited from using the Appellants' own claims as a blueprint about which features of the art may be combined to argue that Appellants' claims are obvious from the art. Hindsight analysis is always improper; an examiner may not read into the prior art the applicant's own teachings; *In re Deminski*, 230 U.S.P.Q. 313 (Fed. Cir. 1986). Further, "The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination." MPEP §2143.01 citing *In re Mills*, 916 F.2d 680, 16 U.S.P.Q.2d 1430 (Fed. Cir. 1990).

The foregoing discussion shows that the system of the Collins et al. '104 reference and the system of the present invention are very different in application and structure. As such it would be improper to combine Collins et al. '104 with either Sharma et al. '620 or Sinclair '489.

When patentability turns on the question of obviousness, the search for and analysis of the prior art includes evidence relevant to the finding of whether there is a teaching, motivation, or suggestion to select and combine the references relied on as evidence of obviousness.

*In re Lee*, 61 USPQ2d 1430,1433 (Fed. Cir. 2002), citing *McGinley v. Franklin Sports, Inc.*, 262 F.3d 1339, 1351-52, 60 USPQ2d 1001, 1008 (Fed. Cir. 2001) ("the central question is whether there is reason to combine [the] references," a question of fact drawing on the Graham factors).

Our case law makes clear that the best defense against the subtle but powerful attraction of a hindsight-based obviousness analysis is rigorous application of the requirement for a showing of the teaching or motivation to combine prior art references.

In re Dembiczak, 50 USPQ2d 1614, 1617 (Fed. Cir. 1999).

**2. The Combination of References Does Not Teach Each and Every Element as Claimed in Claims 28-34, and 36-41**

The Examiner rejects independent apparatus claim 30 and independent method claim 38 in section 2 of the OFFICE ACTION along with independent claims 8 and 23. The Examiner, however, does not address the limitations of independent claims 30 and 38 individually. The Examiner's findings and conclusions discussed above regarding claims 2- 14 and 16-26 are made equally applicable to independent claims 30 and 38.

To be concise and to avoid repetitive text, Applicant incorporates the text above in section B. 1 here by reference. Applicant will focus this section on the particular issue of the lack of teaching of two transmitters and two receivers being symmetrically disposed. The discussion above pointing to the improper combination and lack of motivation is still equally applicable to claims 28-34 and 36-41.

Independent apparatus claim 30 requires:

“(b) at least two transmitters each having an antenna on the inside of the cylindrical enclosure for propagating electromagnetic radiation in the material at least one frequency;

(c) at least two receivers each having an antenna on the inside of the cylindrical enclosure for measuring electromagnetic radiation in the material at the at least one frequency, wherein the at least two transmitters are symmetrically arranged about the at least two receivers, the measurements indicative of the parameter of interest”

Independent method claim 38 requires:

“(d) enclosing the material in the cylindrical enclosure, wherein the enclosure includes a first transmitter antenna and a second transmitter antenna arranged symmetrically about a first receiver antenna and a second receiver antenna”

The examiner makes no specific finding in the OFFICE ACTION regarding the claimed symmetrically arranged transmitters and receivers. It is Applicant's position that these independent claims and the dependent claims from these claims are allowable over the art of record, because nowhere is there a teaching of such a symmetrical arrangement. And as stated above in the summary of the invention, such an arrangement has advantages over the art of record. One advantage of the claimed arrangement is that it is possible to fully compensate for linear changes to the measurement system.

In putting the statutory language of 35 U.S.C. § 35 to practice, the MPEP states:

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art and not based on applicant's disclosure.

MPEP §706.02(j) Contents of a 35 U.S.C. 103 Rejection, (citing) In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Applicant respectfully submits that the Examiner has failed to present a *prima facie* case of obviousness as to claims 28-34 and 36-41, because the art of record does not teach the claimed symmetrical arrangement as claimed in independent claims 30 and 38.

### **3. Conclusion of Non-obviousness**

With respect to the combination of references, the Examiner's rejection rests on flawed logic, i.e., that two structurally different elements are interchangeable because each can be used for measuring a characteristic of a material. The normal definition of the terms considered interchangeable by the examiner clearly show that they are not. And the references themselves show that an antenna has a distinct advantage over an electrode. It is respectfully submitted that a *prima facie* obviousness rejection of the amended claims has not been made, because there is no motivation for one skilled in the art to combine the references as suggested by the Examiner.

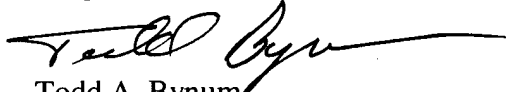
It is respectfully submitted that it appears as if the only way one of ordinary skill in the art could make the above changes to result in the claimed invention herein would be to use the Appellants' claims improperly as a hindsight guide.

Furthermore, with respect to claims 28-34 and 36-41, the Examiner has failed to present a prima facie case of obviousness, because the suggested combination of references does not teach or suggest the claimed symmetrical arrangement of at least two transmitters and at least two receivers.

**IX. PRAYER FOR RELIEF**

It is respectfully submitted that the rejections of the claims have been overcome and/or avoided by the arguments presented above. It is further respectfully requested that the Board reverse the final rejections of the Examiner. The Examiner and/or the Board are encouraged to call the Appellants' attorney at the number below for any reason that may advance prosecution of the case.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Todd A. Bynum", with a long horizontal flourish extending to the right.

Todd A. Bynum  
Registration No. 39,488  
Attorney for Appellants  
Telephone No. 713/266-1130  
Facsimile No. 713/266-8510

In re application of: Macmillan M. Wisler et al.	§ Appeal No. _____
U.S. Serial No.: 09/760,679	§
Filed: January 16, 2001	§ Group Art Unit: 2852
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In a Well Core in a Measurement	§ Confirmation No.: 4076
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## **APPENDIX A CLAIMS ON APPEAL**

## CLAIMS ON APPEAL

Claim 1 (previously cancelled)

2. The apparatus of claim 8 further comprising a processor for processing data measured by the receivers wherein the processed data comprises measures of the parameters of interest.
3. The apparatus of claim 8, wherein the parameter of interest is selected from the group consisting of (i) resistivity and (ii) dielectric constant of the material.
4. The apparatus of claim 8, wherein the material is at least one of a (i) liquid, (ii) solid, and, (iii) a gas.
5. The apparatus of claim 4, wherein the material is flowing.
6. The apparatus of claim 4, wherein the material is stationary.
7. The apparatus of claim 8, wherein the at least one transmitter comprises at least two transmitters, the at least one receiver comprises at least two receivers, and wherein the at least two transmitters are symmetrically arranged about the at least two receivers.
8. An apparatus for measuring a parameter of interest of a material in a subterranean formation, the apparatus comprising:
  - (a) a cylindrical enclosure for enclosing the material;
  - (b) at least one transmitter having an antenna on the inside of the cylindrical enclosure for propagating electromagnetic radiation in the material at at least two frequencies;
  - (c) at least one receiver having an antenna on the inside of the cylindrical enclosure axially displaced from the at least one transmitter for measuring electromagnetic radiation in the material at each of the at least two frequencies, the measurements indicative of the parameter of interest;
  - (d) a core bit operatively coupled to the cylindrical enclosure for separating the material from the subterranean formation; and
  - (e) a drilling tubular for conveying the cylindrical enclosure into a borehole in the subterranean formation wherein the drilling tubular is selected from the group consisting of (A) a drill string and (B) a coiled tubing.
9. The apparatus of claim 8, wherein the at least one transmitter antenna is set in a circumferential recess on the inside of the cylindrical enclosure.
10. The apparatus of claim 9 further comprising a ferrite material positioned in the recess for shielding the cylindrical enclosure from electromagnetic radiation.

11. The apparatus of claim 9 further comprising an epoxy potting material for fixing the at least one transmitter antenna in the recess and protecting the antenna from damage.

12. The apparatus of claim 8, wherein each said antenna is set in a plurality of apertures on the inside of the cylindrical enclosure.

13. The apparatus of claim 12 further comprising a ferrite material positioned in the apertures for electromagnetic shielding of the cylindrical enclosure.

14. The apparatus of claim 12 further comprising an epoxy potting material for fixing the antenna in the apertures and protecting the antenna from damage.

Claim 15 (previously cancelled)

16. The method of claim 23 further comprising using a processor for processing the data to determine measures of the parameters of interest.

17. The method of claim 16, wherein the processor is at a location selected from the group consisting of (i) down hole on a drill string and (ii) on the surface for real time monitoring.

18. The method of claim 23, wherein the parameter of interest is selected from the group consisting of (i) resistivity and (ii) dielectric constant of the material.

19. The method of claim 23, wherein the material is selected from the group consisting of (i) a liquid, (ii) a solid, and (iii) a gas.

20. The method of claim 19, wherein the material is flowing.

21. The method of claim 19, wherein the material is stationary.

22. The method of claim 23, wherein the at least one transmitter comprises at least two transmitters, the at least one receiver comprises at least two receivers, and wherein the at least two transmitters are symmetrically arranged about the at least two receivers.

23. A method for determining a parameter of interest of a material comprising:

- (a) operatively coupling a core bit to a cylindrical enclosure;
- (b) conveying the cylindrical enclosure into a borehole in a subterranean formation on a drilling tubular selected from the group consisting of (A) a drill string and (B) a coiled tubing;
- (c) operating the core bit for separating the material from the subterranean formation;
- (d) enclosing the material in the cylindrical enclosure;
- (e) inducing electromagnetic radiation in the material using at least one transmitter antenna on the inside of the cylindrical enclosure transmitting at least two frequencies; and



(f) measuring with at least one receiver antenna axially disposed from the at least one transmitter the induced electromagnetic radiation in the material at each of the frequencies, the measurements indicative of the parameter of interest.

24. The method of claim 23, wherein the location of the at least one transmitter antenna and the at least one receiver antenna is selected from the group consisting of (i) a recess in the enclosure and (ii) a plurality of apertures in the enclosure.

25. The method of claim 24 further comprising shielding the cylindrical enclosure from electromagnetic radiation with a ferrite material.

26. The method of claim 24 further comprising fixing the at least one transmitter antenna and the at least one receiver antenna in place with an epoxy potting material.

Claim 27 (previously cancelled)

28. The apparatus of claim 30 further comprising a processor for processing data measured by the receivers wherein the processed data comprises measures of the parameters of interest.

29. The apparatus of claim 30, wherein the parameter of interest is selected from the group consisting of (i) resistivity and (ii) dielectric constant of the material.

30. An apparatus for measuring a parameter of interest of a material in a subterranean formation, the apparatus comprising:

- (a) a cylindrical enclosure for enclosing the material;
- (b) at least two transmitters each having an antenna on the inside of the cylindrical enclosure for propagating electromagnetic radiation in the material at least one frequency;
- (c) at least two receivers each having an antenna on the inside of the cylindrical enclosure for measuring electromagnetic radiation in the material at the at least one frequency, wherein the at least two transmitters are symmetrically arranged about the at least two receivers, the measurements indicative of the parameter of interest;
- (d) a core bit operatively coupled to the cylindrical enclosure for separating the material from the subterranean formation; and
- (e) a drilling tubular for conveying the cylindrical enclosure into a borehole in the subterranean formation.

31. The apparatus of claim 30, wherein the drilling tubular is selected from the group consisting of (A) a drill string, and, (B) a coiled tubing.

32. The apparatus of claim 30, wherein each transmitter antenna is set in a circumferential recess on the inside of the cylindrical enclosure.

33. The apparatus of claim 32 further comprising a ferrite material positioned in the recess for shielding the cylindrical enclosure from electromagnetic radiation.

34. The apparatus of claim 30, wherein the at least one frequency further comprises at least two frequencies.

Claim 35 (previously cancelled)

36. The method of claim 38 further comprising using a processor for processing the data to determine measures of the parameters of interest.

37. The method of claim 36 the processor location is selected from the group consisting of (i) down hole on a drill string and (ii) on the surface for real time monitoring.

38. A method for determining a parameter of interest of a material comprising:

- (a) operatively coupling a core bit to a cylindrical enclosure;
- (b) conveying the cylindrical enclosure into a borehole in a subterranean formation on a drilling tubular;
- (c) operating the core bit for separating the material from the subterranean formation;
- (d) enclosing the material in the cylindrical enclosure, wherein the enclosure includes a first transmitter antenna and a second transmitter antenna arranged symmetrically about a first receiver antenna and a second receiver antenna;
- (f) inducing electromagnetic radiation in the material by sequentially activating the first and second transmitter antennas at at least one frequency; and
- (g) measuring with the first and second receiver antennas the electromagnetic radiation induced in the material by the first and second transmitter antennas, said measurements indicative of the parameter of interest.

39. The method of claim 38, wherein the drilling tubular is selected from the group consisting of (A) a drill string and (B) a coiled tubing.

40. The method of claim 38, wherein the location of the transmitter antennas and the receiver antennas is selected from the group consisting of (i) a recess in the enclosure and (ii) a plurality of apertures in the enclosure.

41. The method of claim 38, wherein the at least one frequency further comprises at least two frequencies.

In re application of: Macmillan M. Wisler et al.	§ Appeal No. _____
U.S. Serial No.: 09/760,679	§
Filed: January 16, 2001	§ Group Art Unit: 2852
For: "Method and Apparatus for	§ Examiner: Reena Aurora
Measuring Resistivity and Dielectric	§
In a Well Core in a Measurement	§ Confirmation No.: 4076
While Drilling Tool"	§ Docket No. 414-16782-US

## **APPENDIX B**

### **DICTIONARY EXCERPTS**

## **Appendix B**

Excerpts from Merriam Webster Webster's Ninth New Collegiate Dictionary

antenna - 2: a usu. metallic device (as a rod or wire) for radiating or receiving radio waves

electrode - 1: a conductor used to establish electrical contact with a nonmetallic part of a circuit 2: a semiconductor device element that emits or collects electrons or holes or that controls their movements